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Balance And Strength Interventions For An Older Individual With Peripheral Polyneuropathy: A Case Report

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The patient signed an informed consent allowing for the use of medical information and photographs for this report and received information on the institution's policies regarding the Health Insurance Portability and Accountability Act (HIPAA).

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Key Words: Peripheral Neuropathy, Balance Training, Strength Training, OTAGO

ABSTRACT

Background and Purpose: Peripheral polyneuropathy (PPN) is a condition resulting from damage to the peripheral nervous system, causing sensory abnormalities (e.g. tingling, burning, and loss of sensation) occurring distally to proximally. Individuals with PPN experience proprioceptive sensory loss and muscle weakness, resulting in decreased functional mobility. A common cause of PPN is diabetes mellitus, however 20-25% of cases are deemed idiopathic. Interventions of balance training and lower extremity strengthening have been shown to have a small positive effect on the progression of PPN. The purpose of this case report is to describe the physical therapy (PT) management of an elderly patient with PPN, elevated fall-risk, and deconditioning.

Case Description: An 81-year-old male who presented with complaints of decreased bilateral foot sensation, unsteadiness in gait, and lower extremity (LE) weakness secondary to a diagnosis of LE PPN received PT twice per week for nine weeks. The PT plan of care included LE strengthening, balance training, and aerobic conditioning. Outcomes included the Lower Extremity Functional Scale (LEFS), Activities-Specific Balance Confidence (ABC) Scale, Timed Up & Go (TUG), and Five Times Sit to Stand (5xSTS).

Outcomes: The LEFS improved from 15/80 to 33/80 and the ABC scale improved from 27.5% to 47.5%. The TUG and 5xSTS times improved from 14.75 seconds to 11.81 seconds and from 27.6 seconds to 18.85 seconds, respectively.

Discussion: Interventions of standing balance training and LE strengthening exercises are safe and may have contributed to improving the patient's functional mobility despite his progressive PPN. Future research would benefit current literature by investigating the effectiveness of standing balance exercises with internal and external perturbations in combination with LE strengthening exercises in patients with PPN.

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Background and Purpose

Peripheral polyneuropathy (PPN) is described as a condition resulting from damage of the peripheral nervous system.[1] The most common form of PPN occurs in a distal and symmetrical pattern, often affecting the toes and the soles of the feet. Sensory abnormalities such as numbness, tingling, paresthesias, or burning are common symptoms experienced by those with PPN.[1] The most common cause of polyneuropathy is diabetes mellitus, however in 20-25% of cases no cause can be determined.[1] It has been found that in some cases of idiopathic PPN, individuals display glucose intolerance or prediabetes.[1] Treatment for PPN, and its associated symptoms, typically consists of symptom management, as well as preventative and palliative therapy, including both pharmacological interventions and physical therapy (PT). Presentation of PPN is unique to each patient, thus there is no specific treatment yet described in the scientific literature. As the disease progresses, many patients require the use of adaptive equipment and/or assistive devices.[1] Although not fatal, patients can experience significant impairment of physical function and an increased risk for falls.[2] Abnormal sensations and loss of sensation tends to spread proximally. Individuals with PPN can be impacted functionally, experiencing proprioceptive sensory loss, as well as general weakness of extensor muscles, thus resulting in unsteadiness of gait and impaired balance.[1]

According to the scientific literature, PT interventions of balance training and lower extremity (LE) strengthening have been shown to have only a small positive effect on the progression of PPN. However, the same studies have found that such an intervention program is safe for sedentary individuals with PPN to participate in, as it did not cause an increase in the their fall risk.[3] Another study found that following participation in a strength and balance training program, individuals experienced significantly fewer falling episodes.[4]

Growing literature suggests the implementation of strength and balance-training exercises for benefitting community-dwelling adults at a high risk for falls; however, there are few evidence-based treatment strategies available to practicing clinicians specific to the diagnosis of PPN.[5] The purpose of this case report is to describe the PT management of an elderly community-dwelling patient with idiopathic PPN, elevated fall-risk, deconditioning, and a history of bilateral total knee and hip arthoplasties.

Patient History & Systems Review

The patient was an 81-year-old male who presented to PT at a hospital-based outpatient rehabilitation clinic with chief complaints of decreased bilateral feet sensation, unsteadiness in gait, and bilateral LE weakness secondary to a diagnosis of bilateral LE PPN. The patient sought out PT following an instance two months prior when, without realizing due to his sensory deficits in both feet, he had dislocated and lacerated his right great toe. He stated that he was unaware of his injury until he looked down while in the shower and saw that he was bleeding. Soon after, he went to the emergency room and had the joint reduced without anesthesia. He also reported that he had experienced a fall two months prior without injury.

The patient's relevant past medical history included bilateral idiopathic PPN, diagnosed two years prior to the episode of care (EOC), pre-diabetes mellitus, cardiomyopathy, atrial fibrillation, morbid obesity, and bilateral total hip and total knee arthroplasties. He utilized various medications (see Table 1) to control his cardiovascular comorbidities. A ½ inch custom heel lift in his left shoe of to accommodate a leg length discrepancy on his left side was also noted. Electromyography testing performed during a neurologist consult two years prior to EOC found mild to moderate axonal neurogenic changes in the bilateral LEs. The consulting neurologist did not attribute the PPN diagnosis to pre-diabetes. His blood work regarding the classification of pre-diabetes status has remained stable since this initial diagnosis. He had been

taking three 600 mg doses of Gabapentin daily to treat the symptoms of PPN with little success, given the progression of the patient's sensory loss.

Upon initial evaluation (IE), the patient stated that his primary goal for PT was to improve his balance and strength in his legs, and reduce his risk for future falls. He denied complaints of foot pain. The patient reported to PT ambulating with a straight cane, stating that the cane was used primarily for community ambulation and he was independent in household ambulation without the use of an assistive device. The patient lived in a two-story home with a first floor set up in the northeast for half of the year and spent the winter in the south. He was a retired insurance salesman who received support from both his children and his female partner at home. The entrance of his northeast home was accessed with three steps with a single railing. Review of the patient's history and systems review revealed impairments of the musculoskeletal and neuromuscular systems (see Table 2). The patient presented as an excellent candidate for a case report due to his complex past medical history, along with his enthusiasm for, and compliance with, PT. The patient verbalized and documented his consent to participate in this case report.

EXAMINATION

Tests and Measures

Considering the patient history, and impairments of the musculoskeletal and neuromuscular systems indicated during the systems review, a variety of tests and measures were administered (see Table 3). Active range of motion (ROM) of the right knee was measured in sitting using goniometry as described by Norkin.[6] Bilateral LE strength was assessed in sitting via manual muscle testing (MMT) in accordance with guidelines described by Kendall.[7] According to available literature, MMT has been shown to have good reliability and concurrent validity.[8] Observation of the patient's gait was performed as the patient walked to the treatment room. Comfortable gait speed, ambulating with a straight cane, was also taken over a distance of

four meters with the use of a stopwatch (see Table 3). Recent literature has suggested that gait speed is a valid, reliable, and sensitive measure used to assess functional mobility and patient response to procedural interventions.[9] An antalgic gait pattern was observed, along with impaired bilateral step length, due to limitation in his right knee ROM. A Timed Up & Go (TUG) test was also performed. The TUG is a timed test in which the patient is instructed to rise from a standard chair with arm rests, walk three meters at a safe and comfortable pace, turn, and then walk back to the chair and return to sitting.[10] Timing begins at "go" and stops when the patient is seated.[10] The TUG has been found to be a reliable and valid means of assessing mobility, balance, and risk for falls.[11] A Five Times Sit to Stand Test (5xSTS) was also performed during the patient's initial visit, in which the amount of time it takes for the patient to stand from a chair is used to assess risk of recurrent falls with established cut off scores according to fall risk category. Research studies by Bohannon[12] and Schaubert[13] found that the 5xSTS test had an excellent reliability and construct validity. The patient also completed a Lower Extremity Functional Scale (LEFS) during his initial visit to PT, providing a quantitative self-assessment of the patient's functional impairments at baseline and upon discharge from therapy. Research performed by Binkley et al.[14] suggests that the LEFS is a reliable and valid measure, sensitive to change with an established Minimally Clinically Important Difference (MCID) of 9 points out of 80 total.

A plan to administer an Activities-Specific Balance Confidence (ABC) Scale and a tandem stance balance time test was made in order to gauge the patient's confidence in his balance abilities, as well as to quantify observable improvements in balance impairment. The ABC Scale is a 16-item subjective patient-reported outcome measure, in which patients rate their balance on a rating scale of 0% to 100% confidence in performing various ambulatory and standing activities.[15] The ABC Scale has excellent correlative construct validity with the TUG and excellent reliability.[16,17] Timed tandem stance balance, also known as the Sharpened

Romberg test, consists of placing one foot directly in front of the other, heel in contact with the toe.[18] Franchignoni and colleagues[19] found it be both high in test-retest and interrater reliability.

Clinical Impression: Evaluation, Diagnosis, Prognosis

The tests and measures performed, as well as the history taken, during the initial examination revealed both signs and symptoms consistent with a balance/gait impairment associated with PPN. The patient's observed impairments were primarily due to his medical diagnosis of PPN (ICD-10 code G90.09). The presence of the PPN and a fear of falling were the primary concerns of the patient. Observations of impaired functional mobility, balance, and strength were supported by the results elicited by MMT, a TUG, a 5xSTS, sensation screen, unilateral stance timed balance, gait speed, as well as a previous fall event occurring less than 90 days prior. The patient was modified independent in ambulation, as well as transfers to and from a chair, given the use of his hands or his assistive device. Prognosis was determined to be good due the patient's enthusiasm and willingness for compliance with PT. However, potential barriers for improvement were deemed to be the possible progressive and irreversible nature of PPN and the patient's lack of ROM in the right knee. Limitations in knee ROM have been shown to contribute to gait and balance dysfunction.[20] At the time of IE, he was also advised to attend local Tai-Chi classes to help reduce his risk for falling. According to current literature, community-based Tai Chi was found to prevent decline in both balance and gait impairment among older adults.[21] The patient also revealed during the EOC that he was only able to tolerate the Tai Chi classes in sitting. A randomized controlled trial by Lee, Hui-Chan, and Tsang[22] found that seated Tai Chi exercises improved sitting balance in older adults. Current literature does not examine whether seated Tai Chi exercises can improve standing balance.

It was decided that PT frequency and duration would consist of two visits per week for six to ten weeks. At the tenth visit, all tests and measures previously used would be re-

administered. Interventions consisted of aerobic exercises, balance training, LE strengthening exercises, and gait training. Short and long-term goals for PT are laid out in Table 4.

Intervention and Plan of Care

Coordination, Communication, and Documentation

Communication and coordination was established with the patient's primary care provider upon initiation of the EOC. Written communication set out to provide updates regarding the patient's progress. Observations in the measures of timed static standing balance, gait speed, TUG score, reported pain levels, 5xSTS time, as well as patient reported functional outcome measures, such as the LEFS, were documented at the tenth visit and at time of discharge. At the tenth visit an additional patient reported outcome measure, the ABC Scale, was completed by the patient. The ABC Scale was used to measure the possible change in patient's perceived balance confidence levels from the tenth visit to patient discharge. Coordination and communication was also established between the supervising physical therapist and the student physical therapist regarding the patient's POC. Both the student and the supervising PT provided verbal instruction and/or demonstration of the exercise program carried out during each visit. The exercise program included interventions of therapeutic exercise, balance training, and neuromuscular reeducation. Throughout the EOC, the patient was monitored by both therapists to ensure both proper technique and body mechanics, as well provide adequate safety and guarding. The documentation and electronic health record software system, Epic (Epic Systems Corporation, Madison, WI), was utilized throughout the EOC.

Patient education was provided to the patient regarding the POC, prognosis, along with expected outcomes and goals to be met for PT during the IE. The patient was initially given a small number of standing LE strengthening exercises, as well as a more functional exercise of performing sit to and from stand transfers. Over the course of the episode of care, the HEP was

updated when the patient demonstrated improvements in strength and activity tolerance. The HEP was to be carried out daily, one to three sets a day. However, the patient admitted during the course of care, that he was not 100% compliant in his designated HEP, often going a day or more without performing his HEP. Despite this, the patient arrived regularly to PT with a high level of motivation and a willingness to work hard. Throughout the EOC, the busyness of the clinic resulted in an occasional lack of available exercise equipment, ultimately affecting the consistency of implemented procedural interventions during each daily visit. Thus, the PT was then unable to, at times, guide the patient through the intended intervention plan, substituting with different interventions as needed within the given appointment time. This limitation in care was further exaggerated by the patient's lack of compliance with his HEP.

Upon the initial visit, the patient was scheduled for PT twice weekly for 6-10 weeks. The therapist explained to the patient the possibility of the duration of care being either shorter or longer depending on the patient's progression of care and the attainment of set goals. Due to scheduling conflicts, there were weeks in which the patient was only able to attend PT once.

At the first visit, the patient was given standing LE exercises, carried out in the parallel bars to allow the patient to use his upper extremities (UE) on a sturdy surface to help maintain balance. These initial exercises included standing double leg calf raises, standing alternating marching, standing hip abduction and extensions, and sit to stands from a chair with use of the armrests. All exercises were performed with bilateral LEs unless otherwise stated. All five of these exercises are components of the Otago Exercise Program[23] to prevent falls in older adults. The Otago exercise program consists of exercises designed to develop muscle strength and flexibility, along with retrain balance and improve reaction times, as these are the most easily modifiable factors contributing to risk for falls.[23]

During the second therapy session, the patient began treatment with an aerobic warm-up

exercise on the NuStep TRS Recumbent Cross Trainer (NuStep Inc., Ann Arbor, MI) for 5 minutes at a low resistance. The NuStep is a commercial grade device that provides a seated reciprocal UE/LE flexion/extension exercise movement against graded loads, stimulating the motion of walking.[24] Resistance on the NuStep was progressed overtime, starting at level 3 of 10 levels. Research by Morrison and colleagues found that following an aerobic exercise program, individuals with diabetic PN showed improvements in gait speed and improved postural coordination, which is equated with greater stability.[4] Beginning at the second visit, the patient was instructed to warm-up using the NuStep and then to perform the same exercises from the first visit. The patient was then introduced to perform additional therapeutic exercises including lateral stepping with a REP Band (Magister Corporation, Chattanooga, TN) loop placed around both ankles and forward step-ups onto a 6-inch step. A level 2 REP Band with a resistance level of 5 pounds at 100% extension was utilized initially. Later in the EOC, the patient was progressed to a level 3 REP Band with a resistance level of 6.5 pounds at 100% extension.[25] The patient reported significant pain and discomfort in his right knee during the step-up exercise, which was thus discontinued. A study by Inacio et al.[26] found that a lack of hip abduction strength was associated with impaired balance and risk for falls. The patient was also instructed to rock back and forth, in a slow and controlled manner while standing on a Fitterfirst Professional Rocker Board (Fitter International Inc., Calgary, Alberta) in both the frontal and sagittal planes. The rocker board consisted of a 20" x 20" wooden board mounted on two polypropylene hemispheres that could be tilted on a single-plane up and down three inches.[27] Current evidence suggests that a ten-week training program using a rocker board produced significant improvement in both balance and confidence in older community dwelling adults.[28] The patient required frequent seated rest breaks throughout the 45-minute treatment time.

During the third visit, the patient was introduced to forward and lateral stepping over a 1-

inch tall beam. He was instructed to bring his foot as high as he could, as if he was stepping over a much larger hurdle. This was intended to encourage total foot clearance and stable gait given the need to negotiate potential obstacles. This, and all LE strengthening exercises, were periodically progressed with an increase of repetitions and the inclusion of ankle weights. The hurdle exercise was also later progressed using a 4-inch tall object to step over (see Table 5 for a detailed list of exercise interventions).

TIMELINE

Pre-Admission

- An 81-year-old male diagnosed with Idiopathic Peripheral Polyneuropathy.
- Reports a falling episode without injury.
- Reports an instance in which he dislocated his right great toe without noticing due to lack of sensation two months prior to episode of care.

Day 0

Initial Evaluation

- Functional Outcome Measures: Timed Up & Go (TUG), Five Times Sit to Stand (5xSTS), and Lower Extremity Functional Scale (LEFS) administered.
- Gait Speed and lower extremity Manual Muscle Testing (MMT) and Range of Motion (ROM) measured and recorded.

Days 1-28

Visits 2 through 9:

- Interventions:
  - Aerobic Conditioning
  - Balance Training
  - Strengthening

Day 29

Visit 10 and Progress Note:

- Re-testing of:
  - TUG, 5xSTS, LEFS, and Gait Speed.
- Administration of:
  - Activities-Specific Balance Confidence (ABC) Scale and Timed Tandem Stance Balance.

Days 30-59

Visits 11 through 17:

- Interventions:
  - Progression of Aerobic Conditioning, Lower Extremity Strengthening Exercises, and Balance Training.

Day 60

Visit 18 and Discharge from Physical Therapy:

- Re-testing of Tests and Measures:
  - TUG, 5xSTS, LEFS, and ABC Scale
  - Timed Tandem Stance Balance and Gait Speed
  - Lower extremity MMT and Knee ROM
- Discharge to Community-Based balance maintenance exercise classes offered at the Outpatient Hospital facility.

OUTCOME

Over the course of 18 PT visits, the patient demonstrated significant subjective and functional improvements. Upon discharge, the patient's LEFS score had improved from 15/80 to 33/80, indicating a reduction in disability of 22.5%. The change reported in this outcome measure from IE to the point of discharge is double the value of the reported MCID.[14] From the tenth PT visit to PT discharge (18th visit), the patient also reported a positive change in the ABC Scale, which more than doubled his initial score of 27.5% to 57.5%. Recent literature revealed that the minimal detectable change (MDC) for the ABC Scale was 16.94%.[29]

Additionally, the patient demonstrated some improvement in timed measures at the end of the EOC. His TUG and 5xSTS times went from 14.75 seconds to 11.81 seconds, and from 27.6 seconds to 18.85 seconds, respectively. According to relevant literature, cut-off score indicating risk for falls for the TUG is 13.5 seconds among community dwelling adults,[30] while the MDC is 2.49 seconds.[31] Research by Goldberg et al.[32] reported an MDC of 2.5 seconds for the 5xSTS. Futhermore, timed tandem stance balance improved overall during the EOC, increasing by five seconds. However, the patient's comfortable gait speed did decrease by a total 0.15 m/s from IE to discharge.

Right knee flexion AROM increased from 90 degrees to 95 degrees. This change was negligible due to the reported standard error of measurement of 6.6 degrees.[33] MMT performed at discharge showed improvement in bilateral knee extension and ankle plantarflexion, to 5/5 and 4/5, respectively. Tests and measures taken at IE and discharge can be found in Table 3.

DISCUSSION

The purpose of this case report was to describe a strengthening and balance training program for an elderly community-dwelling patient with idiopathic PPN, elevated fall-risk, deconditioning, and a history of bilateral total knee and hip arthoplasties. The POC was designed

to address the patient's impairments and goals for therapy and was based on applicable research on beneficial strength and balance training for older adults and clinical judgment. Over the course of the EOC, the patient demonstrated improvements in balance, LE strength, patient reported outcome measures, and normalized functional outcome measures (TUG and 5xSTS).

The outcome measures at discharge suggested that the combined LE strengthening, aerobic conditioning, and balance training program might have contributed to the patient's functional improvements and decreased fall risk, as indicated by the improved TUG and 5xSTS scores. One limitation to this study was how busy the clinic was throughout the EOC, making the equipment needed for each visit often occupied, which affected the patient's POC visit to visit.

Positive prognostic indicators included the patient's enthusiasm for, and compliance with, PT in the clinic. He also had familial support at home in the form of positive reinforcement for the positive changes seen by his partner and by regularly accompanying him during his visits that contributed to his overall success in PT. Potential negative prognostic factors included his lack of compliance with his HEP, his multiple comorbidities, and the progressive nature of PPN.

Overall, the outcomes presented in this case suggest that the designed POC, featuring LE strengthening exercises highlighted in the Otago exercise program and balance training exercises, were neither unsafe nor caused an increase in fall risk for the patient. It could be suggested that the POC was beneficial to the patient, improving his functional mobility and a self-rated balance confidence despite his unchanging PPN. Future research would benefit current literature by investigating the effectiveness of balance exercises with internal and external perturbations in combination with functional LE strengthening exercises for older adults with PPN.

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TABLES and FIGURES

Table 1. Patient Medications

Medications/Dosage	Instructions
Hydrocodone-acetaminophen 325 mg	Take 1-2 Tab orally 3 times daily as needed for pain
Warfarin 5 mg	Take 1.5 tabs orally 4 days/week, take 1 all other days
Digoxin 0.25 mg	Take 1 tab orally daily
Doxazosin 4 mg	Take 1 tab orally every evening
Gabapentin 600 mg	Take 1 tab orally three times daily
HydrOXYzine 10 mg	Take 1-2 tabs at bedtime as needed for leg cramps
Metoprolol Succinate 100 mg	Take 1 tab orally daily
Naproxen 500 mg	Take 1 tab orally as needed
Ranitidine 150 mg	Take 1 tab orally 3 times daily as needed for heartburn

Table 2. Systems Review

Systems Review		
Cardiovascular/Pulmonary	Unimpaired	
Musculoskeletal	R LE AROM: Impaired Impaired/Limited Knee Flexion R LE Gross Strength: Impaired	L LE AROM: WFL L LE Gross Strength: Impaired
Neuromuscular	Impaired Static and Dynamic Standing Balance	
Integumentary	Unimpaired	
Communication	Unimpaired	
Affect, Cognition, Language, Learning Style	Unimpaired Language: English Learning Style: Verbal, Demonstration	

Right (R), left (L), Lower Extremity (LE), Active Range of Motion (AROM), Within Functional Limits (WFL)

Table 3. Tests & Measures

Results	Initial Evaluation		Discharge	
Joint & Muscle Actions	**Right LE**	**Left LE**	**Right LE**	**Left LE**
Active Range of Motion				
Knee	0-90°	WFL	0-95°	WFL
Manual Muscle Testing				
Hip Flexion	4/5	4/5	4/5	4/5
Knee Flexion	4+/5	4+/5	4+/5	4+/5
Knee Extension	4/5	4/5	5/5	5/5
Ankle Dorsiflexion	4-/5	4+/5	4-/5	4+/5
Ankle Plantarflexion	3/5	3/5	4/5	4/5

Functional Outcome Measures			
Tests	**IE**	**10th Visit**	**Discharge**
Lower Extremity Functional Scale (LEFS)	15/80 (81.25% Impaired)	22/80 (72.50% Impaired)	33/80 (58.75% Impaired)
Activities-specific Balance Confidence Scale	Not Collected	440/1600 (27.5%)	920/1600 (57.5%)
Timed Up & Go Test (With a Straight Cane)	14.75 seconds	13.85 seconds	11.81 seconds
Tandem Stance Balance	Not Collected	3 seconds	8 seconds
Five Times Sit to Stand Test (*Required Use of Hands)	27.60 seconds	22.34 seconds	18.85 seconds
Gait Speed (*with use of straight cane)	0.78 m/s	0.64 m/s	0.63 m/s

Lower Extremity (LE), Within Functional Limits (WFL), Initial Evaluation (IE)

422 **Table 4. Goals for Therapy**

Short Term Goals to be completed in 2 weeks	**Status at Discharge**
1. Patient will demonstrate independence and compliance with HEP	Not Met
Long Term Goals to be completed in 8 weeks	
1. Improve LEFS score from 15/80 to 40/80	Not Met, but improved.
2. Improve Gait Speed from 0.78 m/s to 0.9 m/s.	Not Met
3. Improve TUG from 14.75 seconds to </= 13.5 seconds.	Met
4. Improve 5xSTS from 27.6 seconds to </= 20 seconds.	Met
5. Improve Bilateral Knee Extension, Flexion, Hip Flexion, Ankle Plantarflexion, and Ankle Dorsiflexion strength to a 5/5 using MMT	Not Met
6. Improve Tandem Stance Balance from 3 seconds to 10 seconds.	Not Met, but improved.

423 Home Exercise Plan (HEP), Lower Extremity Functional Scale (LEFS), Timed Up & Go (TUG), Five Times Sit to
424 Stand (5xSTS), Manual Muscle Testing (MMT)

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426 **Table 5. Procedural Interventions.**

	Rx Day 1	**Rx Day 2**	**Rx Day 3**	**Rx Day 4**	**Rx Day 5**
Calf Raises	1x10	1x15	1x15	1x15	
Sit to Stand	1x5				2x5 With Suspension straps (TRX)
Standing Hip Abduction	1x10	1x10		1x15	
Standing Marching	1x10	1x10			
Standing Hip Extension	1x10	1x10		1x15	

Lateral Stepping with a REP Band		1x60ft Level 2		1x60ft Level 2	1x60ft Level 3
Forward Step Ups with 6" Step		1x10, Discharged from POC			
Rocker Board: Frontal and Sagittal Planes		2x1 minute each	2x1 minute each	2x1 minute each	2x1 minute each
NuStep		1x5 minutes, Level 3	1x5 minutes, Level 4	1x5 minutes, Level 4	1x6 minutes, Level 4
Hurdles: Forward and Lateral Stepping			2x5 1" hurdles each way	2x5 1" hurdles each way	2x5 1" hurdles each way
Tandem Stance on Firm Surface		2x30 seconds, attempts	2x30 seconds, attempts	2x30 seconds, attempts	2x30 seconds, attempts
Staggered Stance on Foampad					1x2 minutes total with Trunk Rotations
	Rx Day 6	**Rx Day 7**	**Rx Day 8**	**Rx Day 9**	**Rx Day 10**
Calf Raises	1x15	1x15	1x15	1x15	
Sit to Stand	2x5 With Suspension straps (TRX)			TRX Strap Mini Squat 2x8	
Standing Hip Abduction			1x10 with 3# ankle weights	1x10 with 3# ankle weights	
Standing Hip Extension			1x10 with 3# ankle weights	1x10 with 3# ankle weights	
Calf Stretch/ Seated Hamstring Stretch	2 x 30 seconds	2 x 30 seconds		2 x 30 seconds	

Lateral Stepping with a REP Band	1x60ft Level 3	1x60ft Level 3	1x60ft Level 3	1x60ft Level 3	
Rocker Board: Frontal and Sagittal Planes	2x1 minute each	2x1 minute each	2x1 minute each		
NuStep	1x6 minutes, Level 4	1x6 minutes, Level 4	1x5 minutes, Level 4	1x5 minutes, Level 4	
Hurdles: Forward and Lateral Stepping	2x5 1" hurdles each way	2x5 1" hurdles each way with 3# ankle weights	2x5 1" hurdles each way with 3# ankle weights	2x5 1" hurdles each way with 3# ankle weights	
Tandem Stance on Firm Surface		2x30 seconds, attempts	2x30 seconds, attempts	2x30 seconds, attempts	2x30 seconds, attempts
Staggered Stance on Foampad	1x2 minutes total with Trunk Rotations	1x2 minutes total with Trunk Rotations/Cross Body Reach		1x2 minutes total with Trunk Rotations/Cross Body Reach	
	Rx Day 11	**Rx Day 12**	**Rx Day 13**	**Rx Day 14**	**Rx Day 15**
Calf Raises	1x15	1x15	1x15 with 3# ankle weights	1x15 with 3# ankle weights	1x20 with 3# ankle weights
Sit to Stand	1x5 with UE support.	1x5 with UE support.	1x5 with UE support.	1x6 with UE support.	1x6 with UE support.
Standing Hip Abduction	1x15 with 3# ankle weights	1x15 with 3# ankle weights	1x15 with 4# ankle weights	1x15 with 4# ankle weights	
Standing Hip Extension	1x15 with 3# ankle weights	1x15 with 3# ankle weights	1x15 with 4# ankle weights	1x15 with 4# ankle weights	
Calf Stretch & Seated Hamstring Stretch	2 x 30 seconds each	2 x 30 seconds each	2 x 30 seconds each	2 x 30 seconds each.	

Lateral Stepping with a REP Band		2x50ft Level 3	2x50ft Level 3	2x50ft Level 3	2x60ft Level 3
Rocker Board: Frontal and Sagittal Planes	2x1 minute each	2x1 minute each	2x1 minute each	2 x 1 minute each.	2 x 75 seconds each.
NuStep	1x5 min Level 5	1x5 min Level 5	1x5 min Level 5	1x6 min Level 5	1x6 min Level 5
Hurdles: Forward and Lateral Stepping	3x5 over 1" hurdles	3x5 over 1" hurdles	3x5 over 4" hurdles	3x5 over 4" hurdles	3x5 over 4" hurdles
Tandem Stance on Firm Surface	2 x 30 seconds each	2 x 30 seconds each	2 x 30 seconds each	2 x 30 seconds each	2 x 30 seconds each
Staggered Stance on Foampad	2 x 1 minute each with cross body reaching.	2 x 1 minute each with cross body reaching.	2 x 1 minute each with cross body reaching.	2 x 1 minute each with cross body reaching.	2 x 1 minute each with cross body reaching.
	Rx Day 16	**Rx Day 17**	**Rx Day 18**	**Discharge**	
Calf Raises	1x20 with 3# ankle weights	1x20 with 3# ankle weights	1x20 with 3# ankle weights		
Sit to Stand	2x5 with UE support.	2x5 with UE support.	2x5 with UE support.		
Standing Hip Abduction					
Standing Hip Extension					
Calf Stretch & Seated Hamstring Stretch	2 x 30 seconds each	2 x 30 seconds each	2 x 30 seconds each		
Lateral Stepping with a REP Band	2x60ft Level 3	2x60ft Level 3			

Rocker Board: Frontal and Sagittal Planes	2x1 minute each	2x1 minute each		
NuStep	1x6 min Level 5	1x6 min Level 5	1x6 min Level 5	
Hurdles: Forward and Lateral Stepping	3x5 over 4" hurdles	3x5 over 4" hurdles	3x5 over 4" hurdles	
Tandem Stance on Firm Surface	2 x 30 seconds each	2 x 30 seconds each		
Staggered Stance on Foampad	2 x 1 minute each with cross body reaching.	2 x 1 minute each with cross body reaching.	2 x 1 minute each with cross body reaching.	

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429 **CARE Checklist**

430 ***Final Parts One & Two, PTH708:*** Completed for the final submission to document the locations

431 of key case report components.

	CARE Content Area	Page
1.	**Title** – The area of focus and "case report" should appear in the title	1
2.	**Key Words** – Two to five key words that identify topics in this case report	1
3.	**Abstract** – (structure or unstructured)	2-3

a. Introduction – What is unique and why is it important? b. The patient's main concerns and important clinical findings. c. The main diagnoses, interventions, and outcomes. d. Conclusion—What are one or more "take-away" lessons?	
4. **Introduction** – Briefly summarize why this case is unique with medical literature references.	3-4
5. **Patient Information** a. De-identified demographic and other patient information. b. Main concerns and symptoms of the patient. c. Medical, family, and psychosocial history including genetic information. d. Relevant past interventions and their outcomes.	5-6
6. **Clinical Findings** – Relevant physical examination (PE) and other clinical findings	6-9 22-24
7. **Timeline** – Relevant data from this episode of care organized as a timeline (figure or table).	14
8. **Diagnostic Assessment** a. Diagnostic methods (PE, laboratory testing, imaging,	8-9 22-24

surveys). b. Diagnostic challenges. c. Diagnostic reasoning including differential diagnosis. d. Prognostic characteristics when applicable.	
9. **Therapeutic Intervention** a. Types of intervention (pharmacologic, surgical, preventive). b. Administration of intervention (dosage, strength, duration). c. Changes in the interventions with explanations.	9-12. 24-28
10. **Follow-up and Outcomes** a. Clinician and patient-assessed outcomes when appropriate. b. Important follow-up diagnostic and other test results. c. Intervention adherence and tolerability (how was this assessed)? d. Adverse and unanticipated events.	9. 15
11. **Discussion** a. Strengths and limitations in your approach to this case. b. Discussion of the relevant medical literature. c. The rationale for your conclusions.	16-17

d. The primary "take-away" lessons from this case report.	
12. **Patient Perspective** – The patient can share their perspective on their case.	6
13. **Informed Consent** – The patient should give informed consent.	6